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ABSTRACT

A salary prediction model for college faculty that is used at Georgia State University was reviewed and tested using multiple regression analysis. Various model specifications, incorporating academic rank, academic discipline, and academic experience, including professional and personal background characteristics, are reviewed. Academic rank is an important determinant of salary, and it is strongly related to three key indicators of academic performance: teaching ability, scholarship, and service. Academic discipline is another important salary determinant that is influenced by the supply and demand in the academic labor market for that discipline, institutional factors, including fluctuation in student enrollment; and department factors which influence salary, including paradigm development. Paradigm development is the level of agreement within an academic discipline of research methodology, course content, and research issues and problems. Background characteristics of faculty interact in a complex fashion with academic discipline and department to influence salary outcomes. The next most important characteristic in model specification is a component reflecting academic experience. The prediction equation incorporates rank, administrative status, discipline, and years in rank, endowed chair and contract status, or full-time equivalence. To explain the dynamics of faculty rewards, other equations were also employed, which include possible discriminatory variables, such as sex, race, age, and years employed. The equations were developed for the major colleges of the university, and separate equations for males and females were calculated. It was found that 90 percent of the variance in the salaries of teaching faculty could be accounted for by the prediction model. (SW)

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REVIEW OF MODEL SPECIFICATIONS

Institutional Research Report 81-12

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by

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This is a technical companion report to Regression Analysis of Teaching Faculty Salaries (IR 81-13).

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Review of Model Specifications

A sizable body of literature has been published on university faculty. It is interesting to understand how any institution works, and whether and to what extent inequities exist in its reward structure. Much can be learned when the activities and characteristics of its faculty are related to the reward structure, and the degree to which such characteristics predict salaries gives insight into the dynamics of the institution.

The selection of variables to include in a model of faculty salaries is the key determinant of the outcome of the model. This critical phase is often the least discussed (Muffo, et al., 1979). It is a truism that the model is no better than the care and concern displayed in its preparation. Many subtle factors impact upon faculty salaries and no formal quantitative model can be expected to incorporate every possible factor.

This is a technical report prepared as background for extending the salary model and performing a multivariate analysis of faculty salaries at Georgia State University. It provides the methodological basis for the subsequent report and addresses the statistical technique, predictor variables, and the limitations of each in applied research applications.

This technical report will present (1) a review of various model specifications, incorporating academic rank, academic discipline, and academic experience, including professional and personal background characteristics; and (2) the prediction model of salaries. A test of the model using the statistical technique of multiple regression and an analysis of those incidences where the model predicted a salary for individual

faculty members which is significantly different from actual salary will be presented in the second report.

Specification of Models

Ramsay (1979) has argued that to "simply use a prepackaged model is dangerously naive. The numerical results of regression analyses are objective and value-free, yet those results and the interpretation are crucially determined by the underlying model" (p. 52). He argues against crude empiricism and for a simultaneous equation model where salary is a function of salary increases over time, academic discipline and academic rank. An additional equation that he includes determines rank using a function which includes scholarship, highest degree and experience. His advocacy of this form of model is a result of certain problems that can develop from unsophisticated modeling, including step-wise regression of salaries. The model builder must be concerned with how and why each variable is important. To fail to do this is to invite a number of problems resulting from ad hoc models. These include co-linearity (see Belsley, et al., 1980) proxy variables; specification bias or omitted variables; and simultaneous equation bias. To use a single equation, Ramsay feels, abstracts reality while at the same time distorts it.

Rank

Previous research on faculty salaries generally agrees that faculty rank is the strongest predictor of salary. Faculty rank is both an objective variable and, importantly, a proxy variable. A proxy variable is a surrogate for a factor or factors that has not or cannot be readily measured. Ramsay (1979) has noted that it is impossible to test if a proxy variable

is a good proxy. He advocated the importance of salary being modeled on a hierarchical basis. Given the seminal nature of rank in determining salary, it is necessary to assume that rank is a function of non-discriminatory factors. Thus, rank can be seen as a measure of many implicit and explicit characteristics of a given faculty member. Typically, the academic rank is strongly related to the three key indicators of academic performance--teaching ability, scholarship, and service, all difficult to measure. This also infers that, given rank, the relationship of various crude measures of these three performance characteristics may not show up as being strongly predictive of salary. This is not a problem; rather, it is a consequence that should be noted.

Academic Discipline

Equal in importance to academic rank as a determinant of salary is academic field or discipline. The impact of discipline upon faculty rewards is complex and confounding; it is a variable heavy with ambiguity and obliqueness. Its weight is influenced by the supply and demand in the academic labor market for that discipline; institutional factors, including fluctuation in student enrollment in the discipline with consequent expansion and contraction of the curriculum; and department factors which influence salary, including paradigm development.

Supply and Demand. A state commission on human rights formally ruled that paying differentials by field of competence is not considered an inequity but is a common industry-wide practice (Hunter, 1979). Brittingham, et al. (1979) noted that any offer of positions in the history department brought hundreds of resumes, while filling a position in the accounting department required active recruiting. These market factors

are nationwide and can be considered intrinsic to the system. Academic submarkets for each discipline are such that there is almost no movement between fields (Tuckman, 1979). Salary surveys, however, consistently show that salary differentials among fields are closely followed by similar institutions.

Institutional Factors. The impact of field upon salary is intertwined with the impact of institutional factors upon salaries (Schwab & Dyer, 1979). Student enrollment declines can bring about pressure for curriculum changes in departments which find they are in a disadvantageous institutional position (Manns & March, 1978). Conversely, expansion of the department curriculum affects the promotional opportunities in the department (Keyfitz, 1973).

Departmental Factors. "The departmental affiliation of a faculty member is one of the most salient institutional labels" (Moore & Pfeffer, 1980). A discipline with a high market factor will often be one that is a powerful department in the institution. Given that faculty advancement is both a function of individual performance and of the structural position of the individual in the organization, Moore & Pfeffer (1980) found that the speed of faculty advancement was best indicated by the power of the department; it accounted also for differential rates of promotion between departments. Kalleberg & Sorensen (1979) and Bibb & Form (1977) also found that the power of the department has a significant effect on the rewards in the department.

While each faculty member must learn to prepare his professional case for the maximum likelihood of a favorable response, a strong department is a vital source of assistance due to its contacts, seniority,

prestige, and/or size. A model of power in budget decisions has been suggested (Pfeffer & Moore, 1980), and is shown in Figure 1. This model suggests that in a university, powerful departments would also be those receiving greater amounts of contracts and grants; greater external linkages and contacts of a department would be reflected in higher budgets. Those departments where the department head had access to higher levels of decision making could be expected to protect their budgets better.

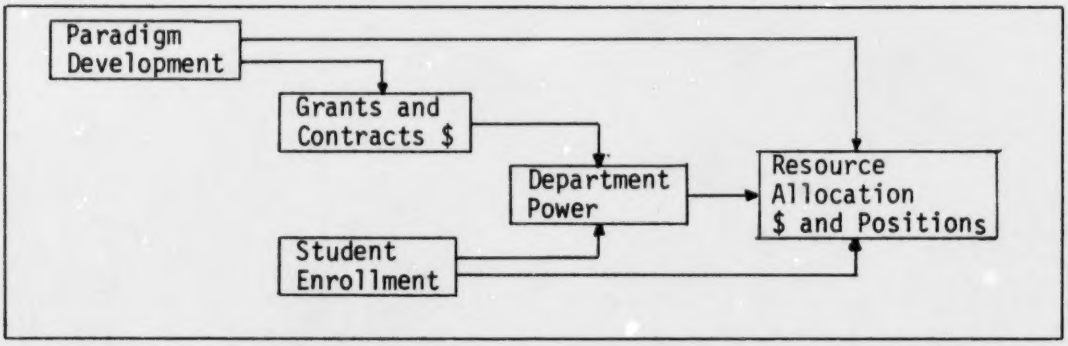

Figure 1. Model: Power in Budget Decisions (from Moore & Pfeffer, 1980)

The paradigm development of an academic discipline influences its budget allocation. Paradigm development is defined as the level of agreement within an academic discipline of (1) research methodology; (2) course content; (3) research issues and problems. The degree to which a department has consensus over theories and methods would be an indication of its level of paradigm development; the greater the level of paradigm, the more centralized power is within a department. Those disciplines with highly developed scientific paradigms have an advantageous position in faculty rank promotion questions because the judgment of faculty quality is more objectively and easily made, and the individual faculty member has clearer

guidelines of what research to do and what and how to teach. This is reflected in clearer and more certain evaluation criteria (see Moore & Pfeffer, 1980).

Department power is conceptually independent of department size as measured by number of faculty and student enrollment, though they may covary. Rather, department power is defined as the ability to achieve desired outcomes and courses of action in circumstances where that department's preferences conflict with other departments.

It is vitally important both from a conceptual and an empirical basis, as previous studies have shown, to include a measure of academic department. Budgeting does not generally follow a "Rational" model, but is more likely to follow a political model.

Background characteristics of faculty members interact in complex fashion with academic discipline and department to influence salary outcomes. One of these characteristics is academic experience.

Academic Experience

The next most important consideration in model specification is a component reflecting academic experience. Faculty seniority denotes experience, with a knowledge of the folkways of campus politics and power. The measurement of faculty experience is done by proxy variables, measuring length of time in a given rank. Seniority is a surrogate for scholarship productivity in the same manner as rank and academic department are so related. Experience, however, is not just linearly associated with salary, but also reflects a non-linear component (Johnson & Stafford, 1974; Tolles & Melichar, 1968). The impact of scholarship productivity tends to overshadow that of teaching and service. Some additional

important variables are those of compensation for administrative service, such as chairman of the department. Additionally, there are special categories within ranks such as Regents' Professor, and endowed chair.

Prediction Model of Salaries

The model used to predict salaries at Georgia State University included what are normally considered unbiased predictors of salary such as rank, experience, highest degree, and discipline. Specifically, the model used incorporated rank, administrative status, discipline, and years in rank, endowed chair and contract status, or equivalent full time (EFT). These variables are the prediction equation of faculty salaries. Additionally, to explain the dynamics of faculty rewards, other equations were also employed. These include an equation where possible discriminatory variables such as sex, race, age and years employed are included to test for the possible presence of inequities.

The equations are developed for the major colleges--Allied Health Sciences, Arts and Sciences, Business Administration, and Education. Also, separate equations for males and females are calculated.

Methods

The technique used to generate the equations was a multiple regression. All variables included in the prediction equation except for years in rank and years employed are dichotomous variables. A dichotomous variable indicates whether an individual faculty member either did or did not have a certain characteristic. For example, he either is or is not a Regents' Professor; he is or is not a member of a specific department.

The years-in-rank variable is included in the number of years in rank and also years-in-rank squared. The squaring of the variable reflects the specification that as years in rank grows greater, the salary benefits for years in rank will decrease. The measure of contract status is EFT, which is measured as one minus EFT (1-EFT). This expedites the interpretation of this variable where the increasing EFT level reflected a lower "correction factor" for having less than 1.00 EFT. The equations other than the prediction equation also include years employed and years employed squared, along with age, being male, being black or being a minority other than black. The total population of teaching faculty as of Fall Quarter, 1980, was 723.

How well the hypothesized model conformed to the data is measured by the multiple correlation squared (R^2). Because of the large number of variables included, the R^2 is shown adjusted for the number of variables included. For each equation there is also a standard error of estimate (SEE). The SEE is simply the standard deviation of the residuals, that is, the difference between actual salaries and predicted salaries. For instance, the prediction equation had an adjusted R^2 of .90. This can be interpreted that 90% of the variance in the salaries of the teaching faculty could be accounted for by the prediction model. The prediction equation will be detailed in the subsequent report.

Summary

This technical report was prepared as background to extend the salary prediction model and to perform a multivariate analysis of faculty salaries. It provided the methodological basis for such an analysis and addressed the statistical technique, predictor variables, and the limitations of each in applied research.

The study presented a review of various model specifications, incorporating academic rank, academic discipline, and academic experience, including professional and personal background characteristics. The study also presented the prediction model of salaries. How well the hypothesized model conformed to the data was measured by the multiple correlations squared (R^2). This measure showed that 90% of the variance in the salaries of the teaching faculty could be accounted for by the prediction model.

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